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ABSTRACT:

CHG DATE=19990617 STATUS=O> A transport flat in the shape of a rectangular
parallelepiped has a stiffened surface defining a loading floor and stiff, bending-resistant side and end portions reinforced by cylindrical or part-cylindrical shells (21) inserted in a box-shaped frame (10 to 14) and connected so as to form a liquid-tight tank. <IMAGE>

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(54) A transport flat

(57) A transport flat in the shape of a rectangular parallelepiped has a stiffened surface defining a loading floor and stiff, bending-resistant side and end portions reinforced by cylindrical or part-cylindrical shells (21) inserted in a box-shaped frame (10 to 14) and connected so as to form a liquid-tight tank.

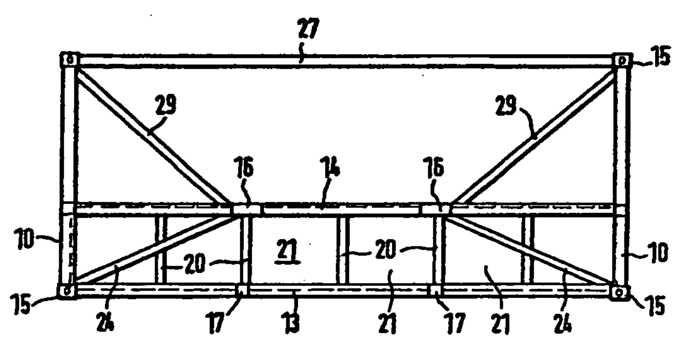

FIG. 1

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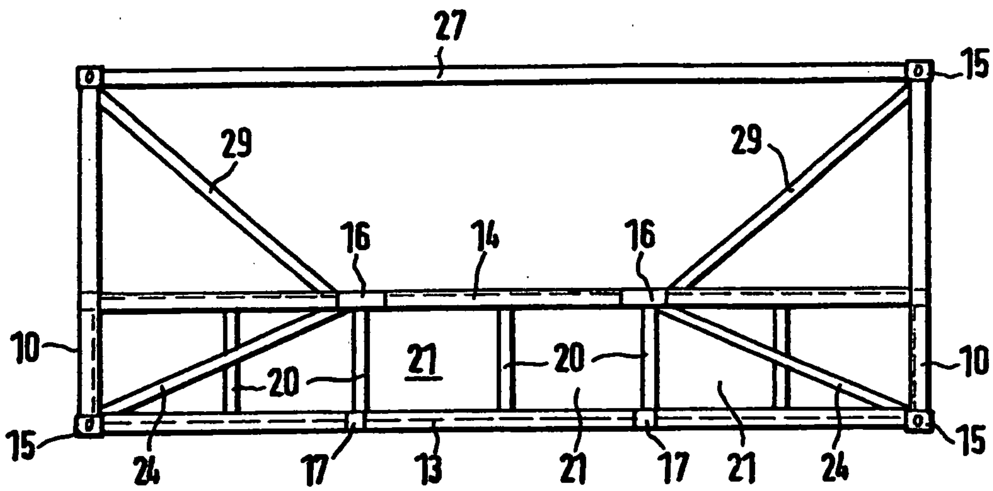


FIG. 1

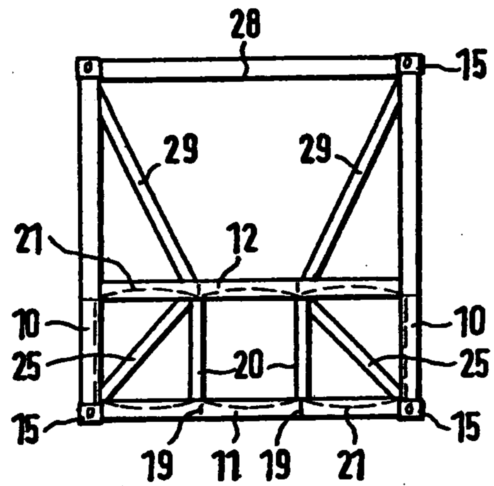
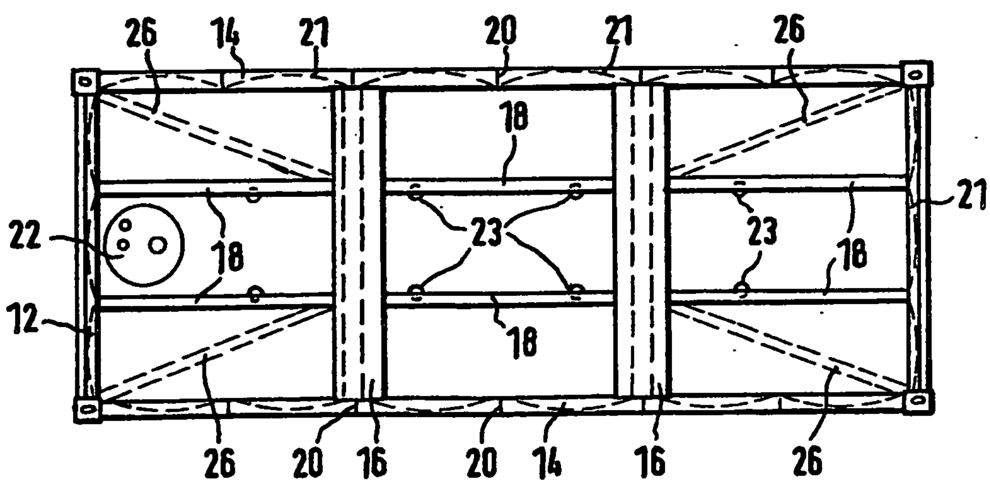


FIG. 2

FIG. 3



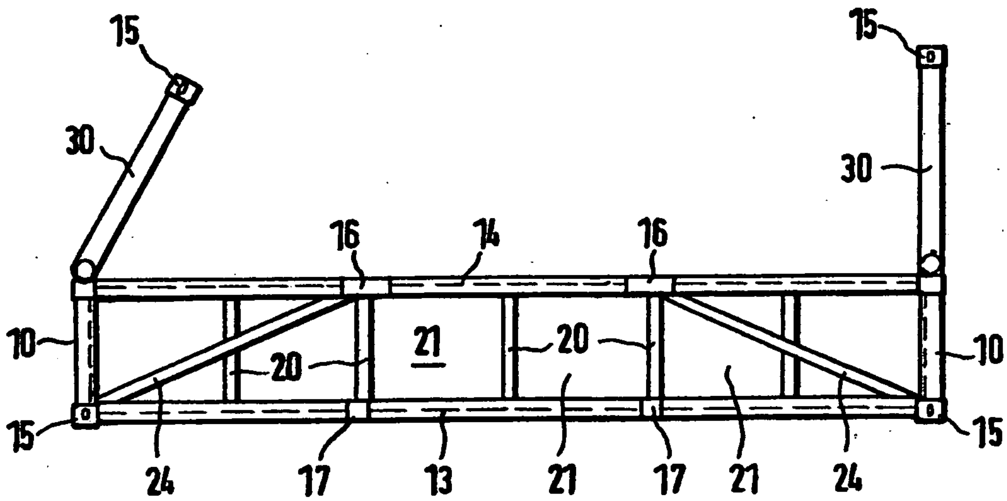


FIG. 4

SPECIFICATION

A transport flat

Transport flats of the type mentioned in the preamble of claim 1 are in use which meet the international standards applying to freight containers as far as their lengths and widths and the corner fittings usually provided at their lower corners are concerned. In contrast to box-like containers, they have either no or incomplete superstructures, i.e. they consist essentially only of a bottom structure. Transport flats of this type serve for transporting heavy loads or other loads which may not or inconveniently be stowed in closed freight containers, either individually or in combination.

In transport flats which, in contrast to containers of a substantially square box or frame section, have no or incomplete superstructures or which often have removable superstructures, all bending loads must be taken by the bottom structure which is required to be designed strong and stiff to withstand bending. Since the required bending resistance is achieved only by a corresponding large spacing between the top and bottom booms, the bottom structure of a transport flat necessarily has a height of its own which is greater than that of a closed freight container and which, in addition, increases with increasing length of the flat.

In the known transport flats, this inherent height defines the dead space which is lost from the load volume defined by the permissible maximum height. Furthermore, because it happens only rarely that similar goods are to be shipped in both transport directions, even the empty transportation of such flats requires considerable transport space even in case of collapsible superstructures.

In addition, in known transport flats, the required stiffness of the bottom structure is achieved by using heavy T or I beams for the side and end portions, which results in a substantial weight of the flat itself.

It is a general object of the invention at least partially to remove such disadvantages as they exist with known transport flats. A more specific object of the invention may be seen to reside in providing a transport flat which has a high stiffness and bending resistance, thus a high loading capacity of its loading floor, the dead weight of which is as small as possible, and which allows a utilization of its unavoidable own volume.

In accordance with the solution to this object as is apparent from claim 1, the tank integrated in the transport flat may be utilized for the transportation of liquids. The transport flat according to the invention thus forms a flat-container which may be utilized as a liquid container during the back-transport, which would be unused in cases where there is no specific load adapted for flat-transportation. Furthermore, the flat according to the invention may be used for the simultaneous transportation of regular part-load and liquids. Such a usability is particularly significant in such cases in which the flat is to be employed as a base or support for various types of machines and aggregates, e.g. as a platform for electric generating aggregates, current generators, fuelling stations, air compressors, pumping, cooling or heating aggregates, vapour generators, aggregates for water purification, water desalinisation, for cleaning of tanks, or the like. In all these cases, the tank integrated in the flat can contain the fuel for the machines and aggregates accommodated on the load floor. Thus, the container flat of the invention allows to form self-contained, independent and operative aggregates which may be transported by usual container shipping methods to any places to be serviced.

Since the flat of the invention is designed as a liquid tank and because part-cylindrical shells are used as its wall elements, the flat has a substantial bending resistance at a relatively low weight. The minimum height which the tank requires for manufacturing reasons adds to its bending resistance. Since the flat-volume is utilized as a tank, the said minimum height is not disadvantageous in terms of space utilization.

In the development of the invention according to claim 2, a particularly high stiffness of the flat is achieved together with a favourable volume utilization.

The vertical tension and compression ties provided in the development of the invention according to claim 3 have again a double function. On the one hand, they add to the stiffening of the flat; on the other hand, they increase the permissible working pressure of the tank as required by legal trade and traffic regulations for inflammable or otherwise dangerous liquids.

In the development of the invention according to claim 4, the tension and compression ties are further improved particularly with respect to their compression and buckling resistance and, while resulting in a favourable weight, they aid in further stiffening the flat and introducing the load forces into the load receiving zones of the bottom.

The embodiment of the invention according to claims 5 and 6 permits the stiffening elements provided inside the tank to be used as damping walls or as separation walls for dividing the tank into a plurality of chambers. Such intermediate walls positively affect the stabilization of the flat.

The open-ended hollow-section bars provided in the embodiment of the invention according to claim 7 not only aid in stiffening the flat but also serve as pockets for receiving the fork of a fork-lifter. The fact that these hollow-section bars extend above the tank results in a favourable weight distribution during handling with such fork-lifters, particularly when the tank is filled, wherein it is a basic advantage that the tank filling lowers the center of gravity of the flat.

The development of the invention according to claims 9 and 10 provides a particularly good introduction of the forces taken by the loading floor of the transport flat immediately into the lower flat corners which may form the only supporting points during transportation.

Advantageous embodiments of the invention will be explained in detail below with reference to the drawings. In the drawings,

Fig. 1 is a side view of a transport flat with a superstructure being indicated;

Fig. 2 is an end view of the flat;

Fig. 3 is a top view of the flat; and

Fig. 4 is a side view of a flat having a different superstructure.

As shown in Figs. 1 to 3, the flat has a box-shaped frame formed of four corner struts 10, two lower transverse spars 11, two upper transverse spars 12, two lower longitudinal spars 13, and two upper longitudinal spars 14. The corner struts 10 and the transverse spars 11, 12 have angular or hollow sections, the longitudinal spars 13, 14 have U sections open to their sides. Standardized corner fittings 15 are mounted at the lower frame corners.

Two hollow-section bars 16 having a rectangular cross-section are inserted between the upper longitudinal spars 14, the ends of the bars 16 extending through corresponding cut-outs in the longitudinal spars 14 and being open. Preferably, the hollow-section bars 16 are equally spaced from the upper transverse spars 12 and from each other. Additional transverse spars 17 preferably consisting of angular cross-section bars are inserted at the same locations between the lower longitudinal spars 13. Additional longitudinal spars 18, preferably equally spaced from each other and from the longitudinal spars 14, are inserted between the upper transverse spars 12 and the hollow-section bars 16. Similarly, additional longitudinal spars 19 are disposed between the lower transverse spars 11 and 17. These longitudinal spars 18 and 19 preferably consist of beams of T-cross-section. Finally, the side and end wall portions of the flat shown in Figs. 1 and 2 are reinforced by vertical struts 20 preferably consisting of angular bars and inserted between the upper and lower spars.

Outwardly curved part-cylindrical shells 21 are welded in the fields formed by the struts and spars of the frame and substantially increase the stiffness of the frame. These shells 21, which may extend across more than one field, are curved about vertical axes in the side and end wall portions of the frame and about axes extending in the longitudinal direction in the bottom and cover surfaces. The shells 21 together form a tank for accommodating liquids. According to Fig. 3, the central upper part-cylindrical shell 21 is provided close to its one end with a manhole which is closed by a cover 22 provided with a suction line, a return opening and a valve.

The design of the flat described above is based on the principle disclosed in the German patent specification No. 1,808,755. That specification, however, had not considered to utilize, and accordingly to design, the container as a platform for transporting regular part-load.

In the transport flat as herein described, the height is preferably no greater than the minimum height of approximately 1000 mm as is necessary in manufacture. This value is required to enable welding and other works that may be required in the interior of the tank. As initially mentioned, such a height simultaneously results in a considerable stiffness. Additionally, a number of tension and compression ties 23 preferably of tubular cross-section is welded between the two upper and lower inner longitudinal spars 18 and 19. These ties which extend through the interior of the tank essentially aid in introducing the forces exerted by the upper loads into the base supporting zones of the lower frame and into the lower frame corners. For further promoting this transmission of forces, diagonal braces 24 and 25 shown in Figs. 1 and 2 may be provided which are inserted between the corners of the hollow-section bars 16 and, respectively, the ends of the inner upper longitudinal spars 18 and the lower frame corners. Instead of these diagonal braces 24 and 25, the diagonal braces 26 shown in Fig. 3 in phantom lines may be provided which extend from the intersections of the hollow-section bars 16 with the upper inner longitudinal spars 18 to the lower frame corners. Both the tension and compression ties 23 and the diagonal braces 26 shown in Fig. 3 not only aid the transmission of forces from the upper boom to the lower boom of the frame but also increase the resistance of the tank against internal overpressure. Different from what is shown in Fig. 3, the tension and compression ties 23 may be distributed in such a manner that four of them extend between the upper hollow-section bars 16 and the corresponding lower transverse spars 17.

In accordance with Figs. 1 and 2, the corner struts 10 of the flat are extended upwardly, and their upper corners having corner fittings are interconnected by longitudinal braces 27 and transverse braces 28 and are connected to the outer ends of the hollow-section bars 16 and, respectively, of the middle upper longitudinal spars 18 by diagonal braces 29. The thus formed end and side frames or walls of the superstructure and the top surface thereof may be filled or covered by panels or tilts. Similarly, the upper surface of the transport flat will regularly be provided with a panel (not shown) forming the loading floor proper.

Instead of the rigid superstructure shown in Figs. 1 and 2, collapsible end or side walls may be pivoted to the flat or means may be provided into which portions of a superstructure may be inserted or otherwise mounted. Fig. 4 shows by way of example a transport flat having collapsible end walls 30, wherein the right-hand end wall is shown fully upright while the left-hand one is shown in a partly folded manner. Similar to the rigid superstructure of Figs. 1 and 2, the end walls 30 are provided at their upper corners with standardized corner fittings 15.

Instead of the tension and compression ties 23 indicated in Fig. 3, which are per se known from US patent specification No. 3,912,103, a different embodiment may be provided with vertical intermediate walls interconnecting the upper and

lower inner longitudinal spars 18 and 19. In this case, the longitudinal spars 18 and 19 are preferably formed as round-section elements as shown in German patent specification No. 2,007,142. These intermediate walls may be provided with openings so that they act as damping walls for settling the liquid contained in the tank, in addition to the curvature of the lateral vertical shells. In a further embodiment, the intermediate walls may be formed as closed separation walls in which case each of the tank chambers requires its own manhole with charging and discharging means.

Instead of forming the vertical tank walls of upright part-cylindrical shells, as assumed in Figs. 2 and 3, it is possible to define the tank volume by three or four cylinders of circular or oval cross-section extending in the longitudinal direction with or without intersections, which may form a plurality of tank chambers separated in the longitudinal direction.

Depending on the type of liquid to be transported, the tank wall may be welded to the supporting parts of the flat-frame, and it may also consist of corrosion-resistant material or be provided with a corresponding corrosive-resistant internal coating.

CLAIMS

1. A transport flat in the shape of a rectangular parallelepiped having stiff, bending-resistant side and end portions, a stiffened cover surface forming the loading floor, and a bottom surface wherein the side and end portions as well as the cover and bottom surfaces include cylindrical or part-cylindrical shells inserted in a box-shaped frame and connected so as to form a liquid-tight tank.

2. A flat according to Claim 1, wherein the side and end portions each contain a plurality of vertically extending part-cylindrical shells.

3. A flat according to Claim 1 or 2, wherein the cover and bottom surfaces are stiffened by horizontal spars between which vertical tension and compression ties are inserted.

4. A flat according to Claim 3, wherein the tension and compression ties are formed by hollow-section members.

5. A flat according to Claim 3, wherein the tension and compression ties are formed by longitudinally or transversely extending intermediate walls stiffened by being curved and/or bent.

6. A flat according to Claim 5, wherein the intermediate walls are formed as separation walls dividing the tank into a plurality of chambers.

7. A flat according to any one of Claims 1 to 6, wherein the cover surface is stiffened by at least two open-ended hollow-section bars extending transversely of the flat.

8. A flat according to Claim 7, wherein vertical tension and compression ties are fixed to the hollow-section bars.

9. A flat according to any one of Claims 3 to 8, wherein diagonal braces are inserted in the side and/or end portions of the frame, which braces extend from the ends of the spars stiffening the cover surface to the lower frame corners.

10. A flat according to any one of Claims 3 to 8, wherein intermediate points of the spars stiffening the cover surface are connected to the lower frame corners by diagonal braces extending through the interior of the tank.

11. A flat according to any one of the preceding claims wherein the transverse and longitudinal walls and the vertical frame edges have means for mounting superstructures on the flat.

12. A flat according to Claim 11, wherein the superstructures are rigidly or movably connected to the flat and enclose the loading space of the flat completely or incompletely.

13. A flat according to any one of the preceding claims including aggregates fixedly mounted thereon.

14. A transport flat constructed, arranged and adapted to operate substantially as herein described with reference to, and as shown in, the accompanying drawings.

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